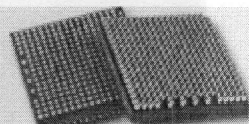



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[Design Briefs]

## Handy Circuit Converts RS-232 To An 8-Bit Discrete Output

William Grill

ED Online ID #10524

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This simple serial RS-232-to-discrete-output application and driver, based on Texas Instruments' 74LV8153, requires only a minimum of parts. The single-wire, RS-232 bit-compatible 74LV8153 supports an internal clock, auto-baud function, and output registers.

Graphic control written in Visual Basic (VB) gives this implementation a Windows-based feel. The circuit is intended as a resource for bench-switch or power-supply controls.

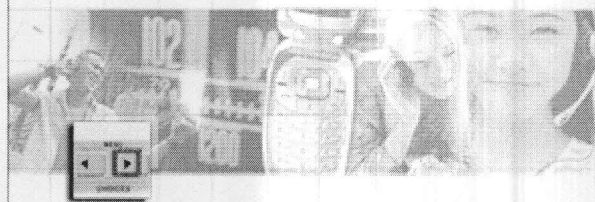
Referring to the schematic in [Figure 1](#), it takes only a transistor (Q1), diode D1, and three resistors (R1, R2, and R3) to support the 74LV8153 8-bit serial-to-parallel interface IC (U1).

D2, C1, C2, R4, and the 78L05 regulator (U2) supply power to Q1, the transistor level shifter, and U1 directly from an RS-232 bus. Diodes D3 and D4 isolate pin 20, allowing a unique power-drive source up to 13.5 V, to drive the outputs.

The 74LV8153 serial-to-parallel interface's protocol includes three address bits for selection of eight devices, providing up to 64 discrete outputs for each serial link. In this application, pins 2, 3, and 4 are strapped, corresponding to A0, A1, and A2 for device address 000. The output drives may be defined as open collector or as active push-pull. Pin 6, OUTSEL, is strapped for its active push-pull output configuration.

A VB executable provides a toggle-switch graphic, text display, and send control box, plus the

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driver panel (*Fig. 2*). Clicking the graphic toggles the switch set, modifies the displayed graphic, and copies the Boolean setting to an array labeled as `toggle_array()`, as shown in the Partial Code Listing.

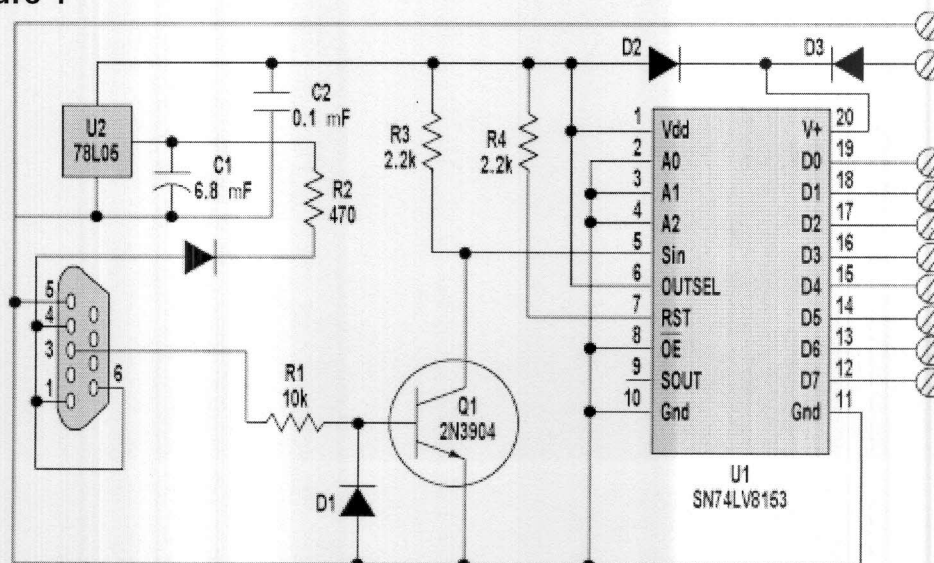
Clicking the "SEND" control box translates these stored values for D0 thru D7, and 3-bit device address, A0 thru A2, from the array into the 2-byte format required by the 74LV8153. It then displays the converted bytes in the text window and sequences them onto the RS-232 serial port and into the hardware shown in *Figure 1*. The serial port defaults to Port 1 but may be respecified to Port 2 by asserting the Port Select toggle.

The Partial Code Listing includes the algorithm that converts `toggle_array` bit values to the protocol needed by the SN74LV8153. The listing uses the passed `toggle_array` values and returns two character codes, B and C, which would be forwarded onto the serial bus. The full VB executable code (DB2144code.exe), as well as the code text listing (DB2144code.txt), are available in the online version of this article at [www.elecdesign.com](http://www.elecdesign.com).

### 1524.zip

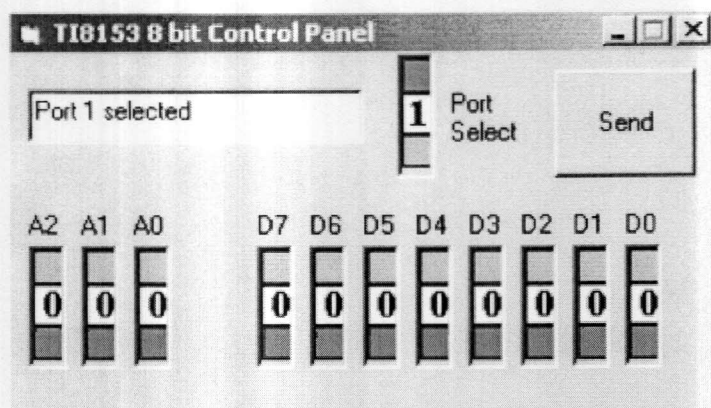
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**Figure 1**



1. Based on a Texas Instruments 74LV8153, this simple circuit performs RS-232-to-discrete 8-bit conversions.

**Figure 2**



2. A Visual Basic program produces a graphic service panel for the 8153 interface IC.

### FOLDER.GIF



### HTMLFILE.GIF



### vssver.scc

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VERSION 4.00

Begin VB.Form panel

```

AutoRedraw      = -1 'True
BorderStyle     = 1  'Fixed Single
Caption         = "TI8153 8 bit Control Panel"
ClientHeight    = 2475
ClientLeft      = 2370
ClientTop       = 5880
ClientWidth     = 4830
Height          = 2880
Left            = 2310
LinkTopic       = "Form1"
MaxButton       = 0   'False
ScaleHeight     = 2475
ScaleWidth      = 4830
Top             = 5535
Width           = 4950

```

Begin VB.PictureBox Picture4

```

Height      = 855
Left        = 2640
Picture     = "sn748153_list.frx":0000
ScaleHeight = 795
ScaleWidth  = 195
TabIndex    = 28
Top         = 0
Visible     = 0   'False
Width       = 255

```

End

Begin VB.PictureBox Picture3

```

Height      = 855
Left        = 2640
Picture     = "sn748153_list.frx":09A2
ScaleHeight = 795
ScaleWidth  = 195
TabIndex    = 27
Top         = 0
Width       = 255

```

End

Begin VB.PictureBox Picture2

```

Height      = 855
Left        = 1200
Picture     = "sn748153_list.frx":1344
ScaleHeight = 795
ScaleWidth  = 315
TabIndex    = 25
Top         = 1320
Visible     = 0   'False
Width       = 375

```

End

Begin VB.PictureBox Picture1

```

Height      = 855
Left        = 1200
Picture     = "sn748153_list.frx":1F7A
ScaleHeight = 795
ScaleWidth  = 315
TabIndex    = 24
Top         = 1320
Visible     = 0   'False
Width       = 375

```

End

Begin VB.TextBox Text1

```

DataField = "Port 1 selected"
Height    = 375

```

```

Left           = 120
TabIndex       = 12
Top            = 240
Width          = 2295
End
Begin VB.CommandButton Command1
Caption        = "Send"
Height        = 735
Left          = 3720
TabIndex      = 11
Top           = 120
Width         = 975
End
Begin VB.PictureBox D0
Height        = 855
Left          = 4200
Picture       = "sn748153_list.frx":2BB0
ScaleHeight   = 795
ScaleWidth    = 195
TabIndex      = 10
Top           = 1320
Width         = 255
End
Begin VB.PictureBox D1
Height        = 855
Left          = 3840
Picture       = "sn748153_list.frx":37E6
ScaleHeight   = 795
ScaleWidth    = 195
TabIndex      = 9
Top           = 1320
Width         = 255
End
Begin VB.PictureBox D2
Height        = 855
Left          = 3480
Picture       = "sn748153_list.frx":441C
ScaleHeight   = 795
ScaleWidth    = 195
TabIndex      = 8
Top           = 1320
Width         = 255
End
Begin VB.PictureBox D3
Height        = 855
Left          = 3120
Picture       = "sn748153_list.frx":5052
ScaleHeight   = 795
ScaleWidth    = 195
TabIndex      = 7
Top           = 1320
Width         = 255
End
Begin VB.PictureBox D4
Height        = 855
Left          = 2760
Picture       = "sn748153_list.frx":5C88
ScaleHeight   = 795
ScaleWidth    = 195
TabIndex      = 6
Top           = 1320
Width         = 255
End

```



DB2144code.txt

```

Begin VB.PictureBox D5
    Height      = 855
    Left        = 2400
    Picture     = "sn748153_list.frx":68BE
    ScaleHeight = 795
    ScaleWidth  = 195
    TabIndex    = 5
    Top         = 1320
    Width       = 255
End
Begin VB.PictureBox D6
    Height      = 855
    Left        = 2040
    Picture     = "sn748153_list.frx":74F4
    ScaleHeight = 795
    ScaleWidth  = 195
    TabIndex    = 4
    Top         = 1320
    Width       = 255
End
Begin VB.PictureBox D7
    Height      = 855
    Left        = 1680
    Picture     = "sn748153_list.frx":812A
    ScaleHeight = 795
    ScaleWidth  = 195
    TabIndex    = 3
    Top         = 1320
    Width       = 255
End
Begin VB.PictureBox A2
    Height      = 855
    Left        = 120
    Picture     = "sn748153_list.frx":8D60
    ScaleHeight = 795
    ScaleWidth  = 195
    TabIndex    = 2
    Top         = 1320
    Width       = 255
End
Begin VB.PictureBox A1
    Height      = 855
    Left        = 480
    Picture     = "sn748153_list.frx":9996
    ScaleHeight = 795
    ScaleWidth  = 195
    TabIndex    = 1
    Top         = 1320
    Width       = 255
End
Begin VB.PictureBox A0
    Height      = 855
    Left        = 840
    Picture     = "sn748153_list.frx":A5CC
    ScaleHeight = 795
    ScaleWidth  = 195
    TabIndex    = 0
    Top         = 1320
    Width       = 255
End
Begin VB.Label Label12
    Caption     = "Port select"
    Height      = 495

```

```
Left = 3000
TabIndex = 26
Top = 240
Width = 495
End
Begin VB.Label Label11
Caption = "D0"
Height = 255
Left = 4200
TabIndex = 23
Top = 1080
Width = 255
End
Begin VB.Label Label10
Caption = "D1"
Height = 255
Left = 3840
TabIndex = 22
Top = 1080
Width = 255
End
Begin VB.Label Label9
Caption = "D2"
Height = 255
Left = 3480
TabIndex = 21
Top = 1080
Width = 255
End
Begin VB.Label Label8
Caption = "D3"
Height = 255
Left = 3120
TabIndex = 20
Top = 1080
Width = 255
End
Begin VB.Label Label7
Caption = "D4"
Height = 255
Left = 2760
TabIndex = 19
Top = 1080
Width = 255
End
Begin VB.Label Label6
Caption = "D5"
Height = 255
Left = 2400
TabIndex = 18
Top = 1080
Width = 255
End
Begin VB.Label Label5
Caption = "D6"
Height = 255
Left = 2040
TabIndex = 17
Top = 1080
Width = 255
End
Begin VB.Label Label4
Caption = "D7"
```



```

        Height      = 255
        Left         = 1680
        TabIndex     = 16
        Top          = 1080
        Width        = 255
    End
    Begin VB.Label Label3
        Caption      = "A0"
        Height       = 255
        Left         = 840
        TabIndex     = 15
        Top          = 1080
        Width        = 375
    End
    Begin VB.Label Label2
        Caption      = "A1"
        Height       = 255
        Left         = 480
        TabIndex     = 14
        Top          = 1080
        Width        = 255
    End
    Begin VB.Label Label1
        Caption      = "A2"
        Height       = 255
        Left         = 120
        TabIndex     = 13
        Top          = 1080
        Width        = 375
    End
    Begin MSCommLib.MSComm MSComm1
        Left         = 4080
        Top          = 1560
        _Version     = 65536
        _ExtentX     = 847
        _ExtentY     = 847
        _StockProps  = 0
        CDSaveout   = 0
        CommPort     = 1
        CTSTimeout   = 0
        DSRTIMEOUT   = 0
        DTREnable    = -1 'True
        Handshaking  = 0
        InBufferSize = 1024
        InputLen     = 0
        Interval     = 1000
        NullDiscard  = 0 'False
        OutBufferSize = 512
        ParityReplace = "?"
        RThreshold   = 0
        RTSEnable    = 0 'False
        Settings     = "9600,n,8,1"
        STThreshold  = 0
    End
End
Attribute VB_Name = "panel"
Attribute VB_Creatable = False
Attribute VB_Exposed = False
' This provides octal discrete driver
,
DefInt A-Z
,
Public Echo          ' Echo On/Off flag.

```

```

                                DB2144code.txt
'Public CancelSend             ' Flag to stop sending a text file.
Dim indx As Integer
Dim togarray(12) As Boolean
'Dim Shared NewPort
'Dim Shared NewBaud$, NewParity$
'Dim Shared NewData$, NewStop$
'Dim Shared NewShake
Dim p
Dim f

```

```

Private Sub A0_Click()
    indx = 0
    toggle
    If togarray(0) Then
        A0.Picture = Picture1.Picture
    Else
        A0.Picture = picture2.Picture
    End If
End Sub

```

```

Private Sub A1_Click()
    indx = 1
    toggle
    If togarray(1) Then
        A1.Picture = Picture1.Picture
    Else
        A1.Picture = picture2.Picture
    End If
End Sub

```

```

Private Sub A2_Click()
    indx = 2
    toggle
    If togarray(2) Then
        A2.Picture = Picture1.Picture
    Else
        A2.Picture = picture2.Picture
    End If
End Sub

```

```

Private Sub Command1_Click()
    On Error GoTo ErrorHandler
    If Picture3.Visible Then
        If MSComm1.CommPort <> 1 Then
            If MSComm1.PortOpen Then
                MSComm1.PortOpen = False
            End If
            MSComm1.PortOpen = False
            MSComm1.CommPort = 1
        End If
    Else
        If MSComm1.CommPort <> 2 Then
            If MSComm1.PortOpen Then
                MSComm1.PortOpen = False
            End If
        End If
    End If

```

```

                                DB2144code.txt
        MSComm1.PortOpen = False
        MSComm1.CommPort = 2
    End If
End If
MSComm1.Settings = "4800,N,8,1"
If MSComm1.PortOpen = False Then
    MSComm1.PortOpen = True
End If
B = 0
For i = 0 To 2
    If togarray(i) Then
        B = B + (2 ^ i)
    End If
Next i
A = 0
For i = 0 To 7
    If togarray(i + 3) Then
        A = A + (2 ^ i)
    End If
Next i
C = 1 + 2 * B + 16 * (A And &HF)
B = 1 + 2 * B + (A And &HF0)
Text1.Text = Hex(C) & "H " & Hex(B) & "H on PORT " & Str(MSComm1.CommPort)
' send the 2 bytes of data
MSComm1.Output = Chr(C)
MSComm1.Output = Chr(B)
Exit Sub
ErrorHandler: ' Error-handling routine.
    Text1.Text = "Error opening PORT"
End Sub

Private Sub Command2_Click()

End Sub

Private Sub D0_Click()
    indx = 3
    toggle
    If togarray(3) Then
        D0.Picture = Picture1.Picture
    Else
        D0.Picture = picture2.Picture
    End If
End Sub

Private Sub D1_Click()
    indx = 4
    toggle
    If togarray(4) Then
        D1.Picture = Picture1.Picture
    Else
        D1.Picture = picture2.Picture
    End If
End Sub

Private Sub D2_Click()
    indx = 5
    toggle
    If togarray(5) Then
        D2.Picture = Picture1.Picture
    Else
        D2.Picture = picture2.Picture
    End If
End Sub

```



```
End If  
End Sub
```

```
Private Sub D4_Click()  
    indx = 7  
    toggle  
    If togarray(7) Then  
        D4.Picture = Picture1.Picture  
    Else  
        D4.Picture = picture2.Picture  
    End If  
End Sub
```

```
Private Sub D5_Click()  
    indx = 8  
    toggle  
    If togarray(8) Then  
        D5.Picture = Picture1.Picture  
    Else  
        D5.Picture = picture2.Picture  
    End If  
End Sub
```

```
Private Sub D6_Click()  
    indx = 9  
    toggle  
    If togarray(9) Then  
        D6.Picture = Picture1.Picture  
    Else  
        D6.Picture = picture2.Picture  
    End If  
End Sub
```

```
Private Sub D7_Click()  
    indx = 10  
    toggle  
    If togarray(10) Then  
        D7.Picture = Picture1.Picture  
    Else  
        D7.Picture = picture2.Picture  
    End If  
End Sub
```

```
Private Sub Form_Load()  
    Text1.Text = "Port 1 selected"  
,  
End Sub
```

```
Private Sub Form_Terminate()  
    End  
End Sub
```

```
Public Sub toggle()  
    togarray(indx) = Not (togarray(indx))  
End Sub
```

```
Private Sub VScroll12_Change()  
End Sub
```

```
Private Sub Picture3_Click()  
    Picture3.Visible = False  
    Picture4.Visible = True  
    Text1.Text = "Port 2 selected"  
End Sub
```

```
Private Sub Picture4_Click()  
    Picture4.Visible = False  
    Picture3.Visible = True  
    Text1.Text = "Port 1 selected"  
End Sub
```